THERMOPLASTIC CAN

The present invention relates to a thermoplastic can and in particular a two piece bottom fill can wherein a permanent base to container seal is effected between a peripheral portion of the base and an internally facing surface adjacent to the lower extremity of the body of the can.

There are many applications where the advantages of a can, and particularly a thermoplastic can, have not yet been exploited due to the lack of a suitable container. For example oil is still commonly sold in bottles and furthermore many food products such as powders or even potato chips are sold in foil lined tubes which are relatively expensive and cumbersome to construct. Of course steel cans are available but these are relatively expensive to produce compared with moulded thermoplastic articles. Thermoplastic cans would naturally have the advantage over and above a necked container such as a bottle for filling and ease of moulding if a satisfactory product was currently available. A necked bottle involves a lengthy mould cycle as compared with an open necked thermoplastic container.

To date however no satisfactory thermoplastic can has yet been proposed probably due to the difficulty of effecting a satisfactory seal between an open neck and a closure.

It is accordingly an object of the present invention to ameliorate one or more of the above mentioned difficulties with existing containers or at least to provide the market with an alternative.

According to the present invention there is provided a thermoplastic can comprising a thermoplastic body having a disc like top moulded as one with a tubular element defining the sides of the body and extending downwardly from the peripheral portions of the top; means associated with the top to facilitate opening by an end user; a thermoplastic base member having an externally directed protrusion adapted to engage a relatively thin walled recess in the radially internally facing lower peripheral portion of the body thereby effecting a permanent seal at the base of the container after filling thereof; the wall thickness of the lower peripheral portion of the body below the thinwalled recess exceeding that of the thinwalled recess.

One embodiment of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a side elevation of a can in accordance with the present invention;

Figure 2 is a perspective view of a can in accordance with Figure 1;

Figure 3 is a detail of a lower peripheral portion of the can of Figure 1 in section, and

Figure 4 is a side elevation of a base for sealing engagement with the can of Figures 1 and 2.

With reference now to Figure 1 there is disclosed a container 1 having a thermoplastic body portion 2 comprising a disc like top portion 3 being unitary with and extending adjacent its peripheral edges 4 into a tubular element 5 to form a container having an opening 6a through which fast filling of the can is possible utilising automated machinery (not shown).

With reference to Figure 4 there is disclosed a base 7 adapted to fit within opening 6a to effect a permanent sealing of that opening.

The lower peripheral portion of tubular element 5 and the outer peripheral portion of base 7 are responsible for effecting a seal when base 7 lies within opening 6a as depicted in part section in Figure 3.

With reference now to Figure 3 it will be observed that base 7 is provided with an externally and downwardly directed annular protrusion 8 which during insertion of base 7 into opening 6a of tubular element 5 rides over and within the bottom of lower extremity 6 of the tubular element and then expands radially outwardly to jump into recess 9 above the bottom of lower extremity 6.

It will be observed that the wall of the lower extremity 6 of tubular element 5 adjacent recess 9 is considerably thinner than the thickness of the bottom of lower extremity 6 of tubular element 5 therebeneath. This differential in thickness of the wall at the positions adjacent to the seal between recess 9 and protrusion 8 and therebeneath permits minor radially outward movement of the thin walled area of the recess 9 and also radially inward creeping of the thicker walled area beneath the undercut due to the superior "memory" of the thermoplastic material at the thicker walled area of lower extremity 6 as compared with the thinner walled area of the extremity adjacent recess 9 after insertion of protrusion 8. The difference in memory is due to the fact that the thinner walled area is subject to some plastic deformation as opposed to the more elastic deformation of the thicker walled area. Polyolefins, PET and PEN will exhibit this useful behaviour. During installation of base 7 into opening 6a initially the bottom of lower extremity 6 of tubular element 5 tends to move radially outwardly. The post base installation movements tend to increase the integrity of the seal formed at the recess 9. In this embodiment a secondary seal is also effected at 10 by the containment of flexible upper annular peripheral extension 11 of base 7 within arcuate recess 12 in tubular element 5. This secondary seal can adopt a number of forms although it is envisaged that it will commonly take the form of a collapsible membrane or compressed pyramid shaped sealing ring moulded into the base 5 and being compressed when the base is inserted into tubular element 5.

In order for the thinwalled area of lower extremity 6 of tubular element 5 to deform outwardly during installation of the base and thereafter it is desirable that the wall of the element at this point be between 0.15 mm and 0.7 mm.

Clearly for an adequate seal to result the materials of construction, thickness and profile of the thin walled area and the protrusion 8 need to be such that the thin walled area has a lesser resistance to plastic deformation that of the protrusion 8.

The outermost edge 13 of protrusion 8 which is responsible for biting into the thinwalled area of recess 9 may vary in profile but preferably it should have a radius of between zero and two mm. Faces 14 and 15 of recess 9 must of course to be angled and shaped so as to be complementary to the protrusion faces 6 and 17 respectively as well as outermost edge 13 of protrusion 8 to facilitate an adequate seal.

Ideally the relationship between the faces 14, and 16 of protrusion 8 and the recess 9 should be such as to provide for an interference of approximately 0.05 mm at all points around the periphery of the base 7.
In the embodiment depicted herein the outermost edge 13 extends into a flat inclined surface 14 therebeneath and in such embodiments it is desirable that such flat edge 14 lies an angle between 15 to 45 degrees

(and preferably between 24 to 32 degrees) from the vertical and mates with similarly inclined surface 16 in recess 9.

Ideally the protrusion 8 itself extends and downwardly towards its radially outward extremity so as to form an angle of between 20 and 45 degrees with the vertical as measured in undercut area 18.

It will be appreciated therefore that the embodiment depicted with reference to Figure 3 contains a secondary seal at 10 and a primary seal at recess 9 with the seal effected at 9 also comprising a mechanical interference fit which prevents removal of the base 7 after sealing of the open base of the can 1.

The tubular body 5 of the can needed not necessarily be circular in cross section but may also be for example rectangular, square, oval or oblong.

Recess 9 is formed as an annular groove moulded into the lower opening of the tubular body 5 of the can which allows outwardly extending protrusion 8 on the base 7 to nest therein when pushed by means of a plattern through the thick walled mouth comprising the opening in the body 5. The maximum diameter of protrusion 8 is of course larger than the maximum diameter of recess 9 to which it is fitted. This interference is critical to the seal of the can. The interference depends on the capacity

and size of can produced but is preferably in the range of 0.1 mm to 0.7 mm.

The can is of course provided with opening means for use by a consumer in upper disc 3. This may comprise a scored area provided with a ring pull in order to facilitate removal of part or most of the top of the can or indeed any other known method for opening a thermoplastic container. For example in respect of oil containers the container may be opened by spearing a steel spike into the top of the container which spike may comprise a spout.

Whatever the configuration of the seal between the base and the body of the container it will be appreciated that the large opening of a two piece can is available to facilitate quick filling prior to sealing of the base and furthermore the mould cycle time of an open container as distinct from a bottle type container is significantly reduced. The reduction in this cycle time is significant as cycle times in connection with thermoplastic necked bottles are in the order of fourteen to sixteen seconds whereas the mould cycle time for a can body in accordance with the present invention is approximately six to ten seconds. Alternate sealing arrangements apart from those depicted in Figure 3 may be devised without departing from the scope and intendment of the present invention.